tabular key based chiefly on neuration and antennæ. Mr. Hampson admits thirty-four families of Indian moths, of which the first twenty-three, including 1158 species, are dealt with in the volume before us. The earlier families of moths are, however, much less numerous in species than the later ones, and it must not be supposed that Mr. Hampson has dealt with anything like half the Indian species in his first volume, which comprises the series of families usually classed under Sphinges and Bombyces, extending, according to the author's classification, from *Saturniidæ* to *Hypsidæ*. The important Bombycide families, *Arctiidæ*, *Agaristidæ*, and *Uraniidæ*, are, however, relegated to the second volume, while several families of more or less doubtful position find a place in vol. i., such as the *Cymatophoridæ*, *Thyrididæ*, *Sesiidæ*, and *Tinægeriidæ*. We observe that Mr. Hampson closes the series of moths with the *Tineidæ*, *Pterophoridæ*, and *Alucitidæ*, and in this adopts the usual classification, though in the main he has struck out an entirely new classification of his own, and the very first innovation which meets the eye is the novelty of commencing the moths with the *Saturniidæ*.

We hope that Mr. Hampson will take an opportunity of discussing the various systems of classification of moths which have been proposed by Guenée, Herrich-Schäffer, Plötz, and other entomologists, not forgetting the strange system proposed by Zebrawski, in his work on the Lepidoptera of Cracow, in which the butterflies are placed in the middle instead of the beginning of the series of Lepidoptera. Such a discussion would be unsuitable in the present work, but if published elsewhere might be very useful.

Long descriptions of genera and species in a work of this character would have been out of place, and we are glad to find that they have been avoided. Each family or subfamily is succinctly characterised, and usually illustrated by a figure of the larva. This is followed by a tabular key to the genera, and then by a notice of the genera and species. The notice of each genus consists of synonymy, type, range, and a brief indication of the principal characters. That of the species includes synonymy, description, including both sexes, and transformations when necessary, range and expanse. An excellent woodcut is usually given of one representative of each genus, showing the wings and body on one side, and the neuration on the other, extra figures of antennæ and legs being sometimes added.

No book, however useful or carefully compiled, can be free from errors, but these cannot be detected at a glance, and the only technical mistake of importance which we have noticed in turning over Mr. Hampson's work is that the broad-bordered Australian *Macroglossum kingii*, Macl., is included among the synonyms of the narrow-bordered *Cephonodes hylas*, Linn.

Much, no doubt, remains to be said about Mr. Hampson's classification, his use of generic names, and his placing together insects regarded as distinct by other authors as synonyms. But these are all points admitting of great difference of opinion, and we do not propose to discuss them further in the present notice.

We should add that various new families, besides many new genera and species, are described by Mr. Hampson for the first time. W. F. K.

OUR BOOK SHELF.

The Year-Book of Science (for 1892). Edited by Prof. T. G. Bonney, D.Sc., LL.D., F.R.S. (London: Cassell and Co., 1893.)

ALL interested in scientific progress will welcome the appearance of the second volume of this useful year-book. The staff of contributors includes such names as Dr. Ramsay, Prof. Seeley, Mr. Botting Hemsley, &c., and the accuracy of the summaries of the year's developments may therefore be thoroughly relied upon. The plan of the volume follows closely on the lines of its predecessor, but it has been extended so as to include geographical and anthropological matters, and zoology has received more complete treatment. If one may judge of the activity in different departments of science by the space required for the account of their progress, electricity and organic chemistry would appear to take the lead. As in the last volume, no attempt has been made to present a complete catalogue of papers. The object has been simply to select the memoirs of exceptional interest; and so far as we have been able to judge, the selections have been judicious. An excellent index of subjects, and one of authors, complete what will no doubt be found a very useful volume.

Treatise on Thermodynamics. By Peter Alexander, M.A. Pp. xii, 203. (Longmans, Green, and Co., 1892.)

THIS is in many respects a singular work. Whole pages, we may almost say whole sheets, are devoted to the multiplication of elaborate proofs of intrinsically simple theorems for which a few lines would be ample allowance, while some of the real difficulties of the subject are but lightly touched on. The other special characteristics, so far as we have seen, are three in number. First, and most prominent, the extraordinary proportion of formulæ to text, which gives the whole the look of a treatise on Partial Differential Coefficients rather than on a branch of Physics. Second, the fearful and wonderful collection of names for special cycles, *e.g. Isothermentropicycle*, *Isobarymegacycle*, *Isenergentropicycle*, &c. Finally, the expressions of doubt or hesitancy with which many steps, universally recognised as valid, are introduced. In the first and second of these characteristics the author far transcends the results of the licence willingly allowed to pioneers like Clausius and Rankine. But these have been (at least in great part) long since discarded, and can never be reintroduced. The third characteristic is, to say the least, not precisely one to be desiderated in a text-book, where we naturally expect to find some slight trace of "Sir Oracle."

Mediæval Lore: an Epitome of the Science, Geography, Animal and Plant Folk-Lore and Myth of the Middle Ages. Being Classified Gleanings from the Encyclopædia of Bartholomew Anglicus on the Properties of Things. Edited by Robert Steele. (London: Elliot Stock, 1893.)

THE original work of which parts are translated in the present volume, may be said to have a place of its own in the history of European literature. It was written in the thirteenth century, and the Latin text was soon widely appreciated, while in the course of the fourteenth century it was translated into French, Spanish, Dutch, and English. The book is full of interest, for it presents a summary of all that was known in the Middle Ages about man and the world. The change which has been gradually effected by the use of modern scientific methods is, of course, incalculable; but some readers will probably be surprised to find to how large an extent Bartholomew mingles the results of shrewd and accurate observation with quaint fancies and unverified judgments. The present volume consists of selections from the edition of Berthelet, 1535; and the good style of the translator adds greatly to the charm of the author's

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philosophy and science. Mr. Steele has done his work with much tact and care, and an interesting preface is contributed by Mr. William Morris.

Astronomy for Every-day Readers. By B. J. Hopkins, F.R.A.S. (London: George Philip and Son, 1893.)

This is a little book which aims at explaining in "as accurate and interesting a manner as possible such of the phenomena of the heavens as should be known to every intelligent person." It consists of six chapters dealing respectively with day and night, the phases of the moon, the tides, the seasons, eclipses, meteors, shooting stars, and comets. Descriptive astronomy is not touched upon, but there is an introductory chapter giving a general survey of the solar system and its dimensions. The book has been very carefully written, and the scientific explanations are much relieved by interesting references to the history of the subject. The author has succeeded in giving very clear and concise accounts of the every-day phenomena with which the book specially deals, and it seems well adapted to awaken a desire for more in the class of readers to whom he more particularly appeals. A biography of the author—who is described as "the working-man scientist"—is also included.

LETTERS TO THE EDITOR.

[*The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of* Nature. *No notice is taken of anonymous communications.*]

Blind Animals in Caves.

In an article in the current number of the *Contemporary Review* Mr. Herbert Spencer discusses the "familiar instance" of blind animals in caves as bearing upon the hypothesis of the transmission of acquired characters. Mr. Spencer is not satisfied with the explanation of the blindness of these cave animals offered by Weismann, who endeavours to account for them by two conditions recognised as operating in regard to other cases by Darwin, viz. cessation of selection and parsimony of growth ("Origin of Species," sixth edition, p. 118), of which the former author has treated under the name Panmyxia. Mr. Spencer shows that the saving of ponderable material in the suppression of an eye is but a small economy: he loses sight of the fact, however, that possibly, or even probably, the saving to the organism in the reduction of an eye to a rudimentary state is not to be measured by mere bulk, but by the non-expenditure of special materials and special activities which are concerned in the production of an organ so peculiar and elaborate as is the vertebrate eye.

That, however, to which I wish here to draw the attention of Mr. Spencer and his readers is this:—Mr. Spencer appears to think that if he disposes of Weismann's explanation of the blindness of cave-animals according to "Panmyxia"—there remains only the explanation by "transmission of acquired characters" in the field. He appears not to be acquainted with the explanation which I have offered of the blindness of cave-animals. It is closely similar to that given by Darwin of the occurrence of wingless insects on oceanic islands. My explanation consists in an application to the case in hand of Darwin's principle of "natural selection." I published it some years ago in my article "Zoology" in the "Encycl. Britannica," reprinted in 1890 in a volume of essays, bearing the title "The Advancement of Science." My suggestion was (and is) as follows, and I should like to see what Mr. Spencer has to say to it:—"This instance (that of the blind cave-animals) can," I wrote in the article above-named, "be fully explained by natural selection acting on congenital fortuitous variations. Many animals are thus born with distorted or defective eyes whose parents have not had their eyes submitted to any peculiar conditions. Supposing a number of some species of Arthropod or Fish to be swept into a cavern or to be carried from less to greater depths in the sea, those individuals with perfect eyes would follow the glimmer of light and eventually escape to the outer air or the shallower depths, leaving behind those with imperfect eyes to breed in the dark place. A natural selection would thus be effected. In every succeeding generation (bred in the dark place) this would be the case, and even those with weak but still seeing eyes would in the course of time escape, until only a pure race of eyeless or blind animals would be left in the cavern or deep sea."

My own position in regard to the hypothesis of the transmission of acquired characters remains what it was ten years ago, viz. that in the absence of observed instances of this transmission and in the presence of repeated observation that particular acquired characters are *not* transmitted, I do not consider it legitimate to *assume* a transmission of acquired characters as the explanation of any given case, such, for instance, as that of the blind cave-animals. I am confirmed in this attitude by the fact that a little consideration has enabled me and others to explain satisfactorily, by reference to no hypothetical causes, but to the admitted and demonstrable facts of "congenital variation" and "natural selection," instances brought forward as "only to be explained on the assumption of the truth of Lamarck's hypothesis."

On the other hand, I have always considered that there is not sufficient ground for asserting that a transmission of acquired characters *can not* take place. The important question is still as it was five years ago, "*Does* it take place?"

Oxford, February 14. E. Ray Lankester.

Glacier Action.

I have read with great interest and pleasure the short review in your paper of last week by Prof. Bonney, giving a summary of the results of a survey of the French freshwater lakes, and indicating as the most probable conclusion that they cannot be accounted for on the theory of the late Sir A. Ramsay, by the digging-out power of glaciers.

Living as I do in a highly glaciated country, and in a country also full of lakes, both fresh and salt, I have never believed in that theory. Lakes seem to me to be due to the same causes which have produced the glens and hollows in which they lie, and these causes cannot be identified with glacier action alone. The theory of Ramsay attributes to glacier action powers and effects which have never been proved to belong to them. Glaciers do not dig out. They rub down—abrade—and scoop, when they are moving down inclined planes at angles more or less steep. But when they reach level ground they do not dig; they rest upon the level surfaces, and when pressed from behind they flow over it. But I have never seen any proof that they can act like a ploughshare, or rather like one of the new digging machines.

In so far as all existing glens may have been formerly occupied by glaciers, their depths must have been increased by glacier action, on the supposition that they were tilted, or upraised at some angle required for this form of true glacier action. On this supposition, indeed, lake basins may be said to be partly due to glaciers. But then this supposition involves and depends upon the assumption that earth movements have made the lake basins what they now are—hollows in a comparative level.

Like all other general theories in the history of geology, the "glacial theory" seems to me to have been ridden to the death, and I have been long waiting for some signs of that reaction or correction which is still much needed. I hold that in this country there is not only no evidence of "ice sheets" overriding all the hills, but the strongest evidence against such sheets. Our glens had true glaciers in abundance, no doubt, and they have left their tool-marks very distinctly. But those marks are quite inconsistent with one universal ice-cap or ice-sheet over all the land. Argyll.

Inveraray, February 16.

Dr. Joule's Thermometers.

Every one will, I am sure, be glad to know that Dr. Joule's thermometers are under investigation by Prof. Schuster.

It is unfortunate that Joule does not give the actual readings of the freezing point, but if the comparison quoted by Rowland was made in either 1879 or 1890 it may be that he referred to the reading of November, 1879, when the total rise of the zero point was 12·92 scale divisions. In that case the original reading in April, 1844, would be 9·70; at any rate this number cannot be very far from the truth.

The temporary changes of zero point alluded to by Prof. Schuster certainly complicate the matter, but from the numbers given it would appear that since 1879 or 1880 there has been a

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